

INVENTOR SEES WORK AHEAD

Dr. Lee De Forest Says
Goal of Perfection in
Radio Is Not in Sight

By LEE DE FOREST.

FOR the most part the radio laboratories at the present time are engaged on the problems coming under the following heads: "battery eliminators," "improved loud-speakers" and "mono-control receivers."

Although the name of the battery eliminators now on the market is legion, few, if any, of these are yet entirely satisfactory. With the rapid growth in popularity of the power amplifiers requiring larger plate voltages and currents, the problem of "B" battery supply, to meet the requirements of radio frequency, detector and power amplifier voltages, is far from solved. A soft tube in the set may completely upset the voltages supplied from the eliminator for other tubes in the line. The desirability of using several tubes the filaments of which cannot properly be connected in series renders the elimination of the "A" battery more difficult. Many more or less successful solutions of this problem by the use of raw AC on the filaments, or by means of heater elements distinct from the cathode emitter, are already on the market, but it is yet too early to say that any of these are thoroughly satisfactory. Certainly an army of clever radio engineers are still busy on this problem, for the goal to be attained is highly attractive, and it is a safe bet that the storage battery will eventually be completely eliminated.

In the meantime small storage batteries with trickle chargers are supplying the requirements of many sets, but this arrangement is at best a palliative, a stop gap, toward the ideal solution. Anything even remotely "wet" must be eliminated from the radio set of the future. Rapid progress is being made along these lines of battery elimination, and the industry has every reason to feel encouraged.

Expects New Loud-Speaker.

As to loud-speakers, every acoustic engineer admits that a perfect loud-speaker does not exist. Many will also admit that the fundamental principle on which the perfect loud-speaker will operate has not yet been developed. Personally, I do not believe that it will ever be attained by means of any type of diaphragm device, whether this be a cone, a flexed membrane, or what have you. The multiplicity of cones on the market and their uniformity as regards defectiveness in tonal qualities are rather disheartening. Some are excellent for the lower frequencies, fewer are for the high, and still less for the middle range. Combinations are being worked out, but the average console set cannot accommodate these and consequently the radio public suffers. So long has the "radio ear" been trained to accept the jargon of noises which come from the average loud-speaker as "radio" or "radio tone" that it is seldom critical after a few seconds of protest. The ear automatically accustoms itself to the deficiencies of the loud-speaker and we imagine we are listening to music. So that with bad quality of jazz music to start with, badly located pick-up arrangements, more or less distortion and overloading in the transmitter, plus what we get in the receiver and amplifier, added to the sorry approximations of the loud-speaker, "the ladies and gentlemen of the radio audience" are still held a long way from Utopia. In my opinion, the radio engineers are not pro-

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gressing as fast as they should in improved loud-speaker designs.

Mono-control: While many of the best sets on the market have mono-control by single dial the fact is incontestable that by the use of vernier condensers the different tuned stages will in every case bring up the efficiency of reception, frequently increasing the range as much as 100 per cent. In mass production of receiver sets there is found to enter a certain amount of variation in inductances and dielectric capacities impossible to avoid. Where we are working within a fraction of a kilocycle a few inches more or less of wire, or a few more drops of insulating compound in the coil, introduce variations impossible to foresee and to balance out by any standardized arrangement of variables. The conveniences of mono-control, however, are so obvious that one is content to sacrifice somewhat in range or selectivity. Meanwhile the wits of radio engineers are battling with this problem of "individual standardization" to secure a combination of condensers and verniers which will automatically operate to give as sharp as possible tuning and maximum efficiency of reception. This is indeed a baffling, but highly intriguing, problem.

It is safe to say that almost every audion tube factory has engineers engaged on problems of filament betterment, to secure longer life emitters of greater efficiency. The opportunities for research along these lines are unlimited. To make a thoroughly reliable oxide-coated filament which can be turned out in large quantities with perfect uniformity, a filament possessing long life and the ruggedness of wire-drawn tungsten, is an end still to be attained.

I have been asked for my opinion as to what will be the outstanding development in the forthcoming radio season. I do not look for any startling development which can be listed ahead of others, but for general improvement as a result of activities of American radio engineers along the lines above indicated, particularly better battery eliminators and, I hope, better loud-speakers.

I have been limiting my considerations thus far entirely to the radio-broadcasting end of the industry,

limited to the wave-length range of the popular broadcasters. When it comes to the field of short-wave transmission unlimited possibilities exist.